9.4 Sequences

Sequence Vocab. #68

sequence - an ordered progression of numbers

finite

infinite

5, 10, 15, 20, 25

2, 4, 8, 16, 32,…,2^k, ...

explicit - each term is defined independently

#68 - back

rule: $a_n = 4 + 5n$

recursive - use the previous term to define the following terms

rule: $a_1 = 5$ $a_{n+1} = a_n - 4$

Convergence/Divergence

#69

if $\{a_n\}$ is a sequence - consider $\lim_{n\to\infty} a_n$

convergence: if the limit is a finite number - the sequence converges

divergence: if the limit is infinite or non-existent - the sequence diverges

Determine whether the sequence converges or diverges. If it converges, give the limit.

2, 4, 6, 8, 10, ...

$\frac{2}{1}, \frac{3}{2}, \frac{4}{3}, \frac{5}{4}, \ldots\ldots$

$\frac{1}{1}, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \ldots\ldots, \frac{1}{n}, \ldots..$

$-1, 1, -1, 1, -1, \ldots..$

Arithmetic Sequence

#243

arithmetic - sequence with common difference between successive terms (repeated addition)

explicit rule: $a_n = a_1 + (n-1)d$

d = common difference
n = term number
a = term

recursive rule: $a_n = a_{n-1} + d \quad n \geq 2$

Find the common difference, a recursive rule, and an explicit rule for the following sequences:

-6, -2, 2, 6, 10, ...

5, 2, -1, -4, -7, ...

Find the first 5 terms of the recursive sequence:

$$b_1 = -1 \text{ and } b_{k+1} = b_k + 10 \quad \text{for} \quad k \geq 1$$

Geometric Sequence

#244

geometric - sequence with a common ratio (quotient) between successive terms (repeated multiplication)

explicit rule: $a_n = a_1 \bullet r^{(n-1)}$

r = common ratio
n = term number
a = term

recursive rule: $a_n = a_{n-1} \bullet r \qquad n \geq 2$

Find the common ratio, a recursive rule, and an explicit rule for the following sequences:

2, 6, 18, 54, ...

4, -2, 1, $-\frac{1}{2}$, ...